INSTRUCTION MANUAL

X-Y DISPLAY

MODEL COS1610/COS1611

MP MASTER
MA31305

Kikusui
INTERNATIONAL CORP.

INSTRUCTION MANUAL

X-Y DISPLAY

MODEL COS1610/COS1611

KIKUSUI ELECTRONICS CORPORATION

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1. GENERAL

Kikusui Model COS1611 X-Y Display is a wide-bandwidth display with frequency response of DC - 5 MHz (-3 dB) for all of X, Y and Z axes. It employs a 6-inch rectangular domed-mesh post-acceleration CRT. The COS1610 is a compact OEM version of the COS1611. The COS1610 is without the casing and its CRT control section can be installed remotely at any required position. The outstanding features of these displays are as follows:

(1) High stability and low drift:

All stages employ differential circuitry, thereby reducing drift caused by temperature change.

(2) Linear and dynamic focus control:

Once the beam spot is adjusted to an optimal focus, this state is automatically maintained regardless of intensity change and sharp traces are displayed even at the corners of the CRT screen.

(3) High intensity CRT:

The CRT has an effective screen size of 94 mm × 104 mm. It a high intensity type with a high beam transmission factor and it operates on a high acceleration voltage of approximately 12 kV, displaying bright and sharp traces optimal for viewing and photographing.

(4) Switching power supply:

The switching power supply circuit operates on an AC line voltage within a range of 90 - 264 V AC, without requiring to modify the power input circuit depending on AC line voltages unlike the conventional types of power supply circuits. This has made the display lighter and consume less power.

(5) Various optional features:

Various optional features such as rack mount, 1/2, 1/5 or 1/10 attenuator, 50-ohm input impedance, persistent-image CRT, internal graticule, and graticule illumination are available to make the display best suit your requirements.

2. SPECIFICATIONS

The specifications of the COS1611 and those of the COS1610 are identical, except those for the mechanical sections and accessories.

(1) Horizontal (X) Axis and Vertical (Y) Axis

Item	Specification	Remarks
Deflection Sensitivity	80 - 200 mV/DIV (Adjustable with front panel control)	1/2, 1/5, or 1/10 attenuator optional
Frequency Bandwidth	DC - 5 MHz (within -3 dB)	50 kHz With reference to 5 DIV
Rise Time	70 ns or faster	
Settling Time	Settled within 5 μs to final spot location	
Linearity	5% or better	For 2-DIV deflection at any point on CRT
Phase Shift	Not greater than 3 degrees (up to 1 MHz)	
Input Impedance	1 MΩ ±2%, approx. 45 pF	50-ohm input optional
Allowable Input Voltage	±50 V (DC + AC peak) (AC frequency not higher than 1 kHz)	When in 50-ohm input: ±3.5 V (DC + AC peak)
Dynamic Range	±10 DIV or more from center of CRT	
Crosstalk	Not greater than 0.05 V	When one input is 50-ohm terminated and 1 Vp-p (500 kHz) is applied to the other input
Drift	Not greater than 0.1 DIV/hour	After 15 minutes of warm-up time

(2) Z Axis

Item	Specification	Remarks
Input Sensitivity	0.5 - 2 V (positive polarity for brighter trace) Set at maximum sensitivity when shipped	1/2, 1/5, or 1/10 attenuator optional
Frequency Bandwidth	DC - 5 MHz	
Rise Time	70 ns or faster	
Input Impedance	1 MΩ ±2%, approx. 45 pF	50-ohm input optional
Allowable Input Voltage	±50 V (DC + AC peak) (AC frequency not higher than 1 kHz)	When in 50-ohm termination: ±3.5 V (DC + AC peak)

(3) CRT

Item	Specification	Remarks
Type	6-inch rectangular, flat type	
Effective Screen Size	82 mm × 102 mm (3.23 in. × 4.02 in.)	
Phosphor	P31	P7 optional
Acceleration Voltage	Approx. 12 kV	
Beam Spot Size	0.45 mm with beam current 0.5 μA	At center of screen
Graticule (External graticule standard)	8 DIV × 10 DIV	Internal graticule optional

(4) AC Line Requirements

Item	Specification	Remarks
Operable Voltage Range	90 - 264 V	
Frequency	50 or 60 Hz	
Power Consumption	Approx. VA	

(5) Mechanical Specifications

o COS1611

Item	Specification	Remarks
Dimensions of Casing	174 W × 133 H × 370 D (mm) (6.85 W × 5.24 H × 14.57 D in.)	
Dimensions Including Extrusions	176 W × 149 H × 400 D (mm) (6.93 W × 5.87 H × 15.75 D in.)	
Weight	Approx. 5.6 kg (12.3 lbs)	

o COS1610

Item	Specification	Remarks
Dimensions of Mainframe	134 W × 123 H × 363 D (mm) (5.28 W × 4.84 H × 14.29 D in.)	
Dimensions Including Extrusions	138 W × 123 H × 390 D (mm) (5.47 W × 4.84 H × 15.35 D in.)	
Weight	Approx. 3.6 kg (7.9 lbs)	

(6) Ambient Temperature and Humidity

To satisfy specifications: 0 to 40°C (32 to 104°F), 90% RH

Maximum operable range: -10 to 45°C (14 to 113°F), 95% RH

(7) Accessories

Power cord ..... 1 Fuse 1A ...(99-00-0017) 1

Instruction manual 1

The following items are supplied for the COS1610 only:

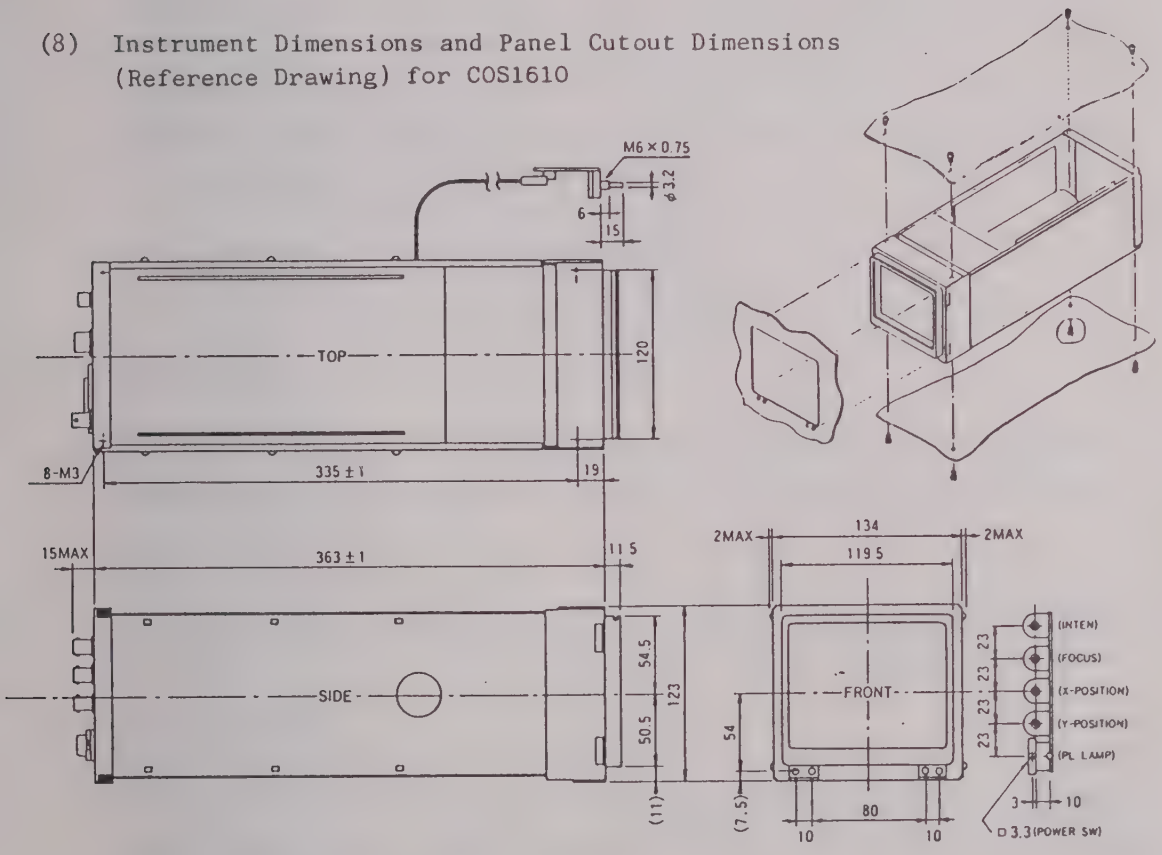
CRT control knobs 4

CRT control nuts 4

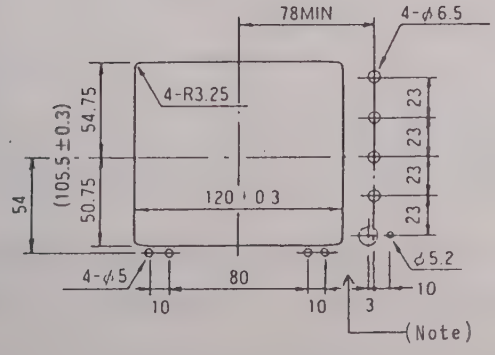
CRT control washers 4

Hex wrench for knobs 1

(8) Instrument Dimensions and Panel Cutout Dimensions (Reference Drawing) for COS1610



Panel Cutout Dimensions (Reference Drawing)



Note: Differs by the shape of the power switch button.

3. PRECAUTIONS BEFORE USE

(1) Unpacking the Instrument

Upon receipt of the instrument, please unpack and inspect it for any damage which might have been sustained during transportation. If any sign of damage is found, immediately notify the bearer or the dealer.

(2) Checking the AC Line Voltage

The instrument operates on an AC line voltage within the range shown below, with line frequency 50 or 60 Hz. Be sure to check the line voltage before connecting the AC power cord to an AC line outlet. Note that the instrument may not operate normally or may be damaged if the voltage is not within this range.

Operating Voltage Range	Fuse
90 - 264 V	1 A

(3) Environment

The operable temperature range of the instrument is -10°C to 45°C. Operation of the instrument outside of this range may cause damage to the instrument.

It is not recommendable to operate the instrument in a strong electric or magnetic field since such will adversely affect the measurement.

(4) CRT Intensity

In order to protect your eyes and prevent permanent damage to the CRT, do not make the CRT trace excessively bright or leave the spot stationary for more than a few moments.

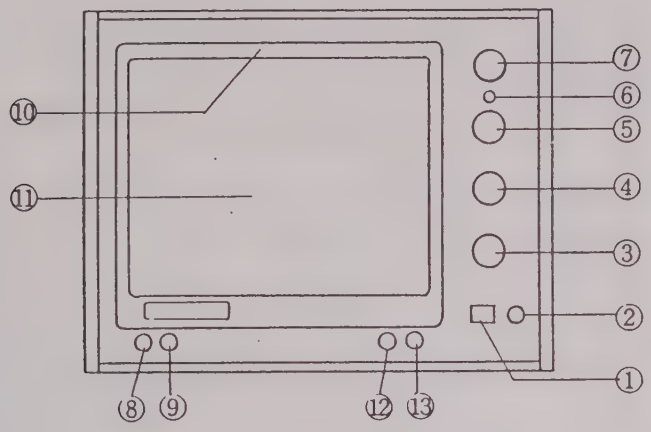
(5) Maximum Allowable Input Voltages

The maximum allowable input voltages of all of the X, Y and Z axes are 50 V (DC + AC peak; AC frequency not higher than 1 kHz).

Note that, when the input terminals are 50-ohm terminated, the maximum allowable input voltages are ±3.5 V (DC + AC peak).

4. DESCRIPTION OF PANELS

(1) Description of Front Panel



o Power Switch and CRT Circuits

Power ..... (1) Main power switch of the instrument. When this switch is turned on, LED lamp (2) illuminates.

FOCUS ..... (5) For focussing the trace to the sharpest image.

ILLUM (optional).. (6) Graticule illumination adjustment.

INTEN ..... (7) Controls the brightness of the spot or trace.

TRACE ROTATION ... (8) Potentiometer (screwdriver adjustment type) for aligning the trace in parallel with graticule lines.

ASTIG ..... (9) Astigmatism control (screwdriver adjustment type of potentiometer). To be adjusted so that the beam spot becomes a true circle after adjusting it with the FOCUS control (5).

Bezel ..... (10) For mounting a camera in one-touch operation.

Filter ..... (11) For easy viewing of displayed waveform. Can be removed in one-touch operation.

o Horizontal (X) and Vertical (Y) Circuits

X-POSITION ..... (4) Horizontal position control of spot or trace.

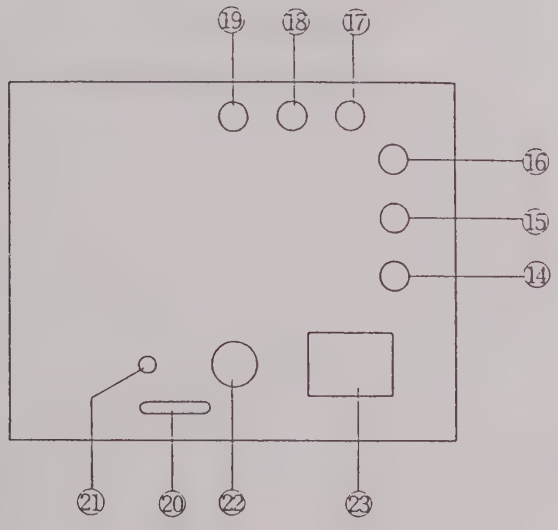
Y-POSITION ..... (3) Vertical position control of spot or trace.

X-GAIN ..... (12) X-axis deflection sensitivity control (screw-driver adjustment type of potentiometer) for 80 - 200 mV/DIV.

Y-GAIN ..... (13) Y-axis deflection sensitivity control (screw-driver adjustment type of potentiometer) for 80 - 200 mV/DIV.

Note: If an optional attenuator is provided, refer to the items for the options.

(2) Description of Rear Panel



o X, Y, and Z Axis Circuits

X^+ AXIS INPUT .... (16) Positive input terminal of X axis.

Y^+ AXIS INPUT .... (15) Positive input terminal of Y axis.

Z^+ AXIS INPUT .... (14) Positive input terminal of Z axis.

(Optional)

X^- AXIS INPUT .... (19) Negative input terminal of X axis.

Y^- AXIS INPUT .... (18) Negative input terminal of Y axis.

Z^- AXIS INPUT .... (17) Negative input terminal of Z axis.

o AC Power Input Circuit

Fuse ..... (22) Fuse (1 ampere) in the primary circuit.

AC power input connector 23
Connector for AC input power. Connect the AC power cord (supplied) to this connector.

o Others

Serial No. ..... (20) Instrument identification number. (When ordering for service, please indicate this number.)

GND ..... (21) Ground terminal.

5. OPERATION METHOD

(1) Set the switch and controls as shown in the following table.

Switch or Control		Setting	
POWER	①		OFF state
INTEN	⑦		3 o'clock position
FOCUS	⑤		Mid-position
ILLUM (optional)	⑥		Counterclockwise position
X-POSITION	④		Mid-position
Y-POSITION	③		Mid-position

(2) After connecting the switch and controls as above, connect the power cord to an AC line outlet.

(3) Turn on (⏍) the POWER switch ① and confirm that the LED lamp ② turns on. A beam spot will appear in the center of the CRT in approximately 20 seconds. If no beam spot appears even when approximately 60 seconds has elapsed from the above, repeat the procedure starting by (1).

(4) Adjust the beam spot to an appropriate brightness and sharpest image by means of the INTEN control ⑦ and FOCUS control ⑤. Adjust the beam spot to a round shape with the ASTIG control ⑨.

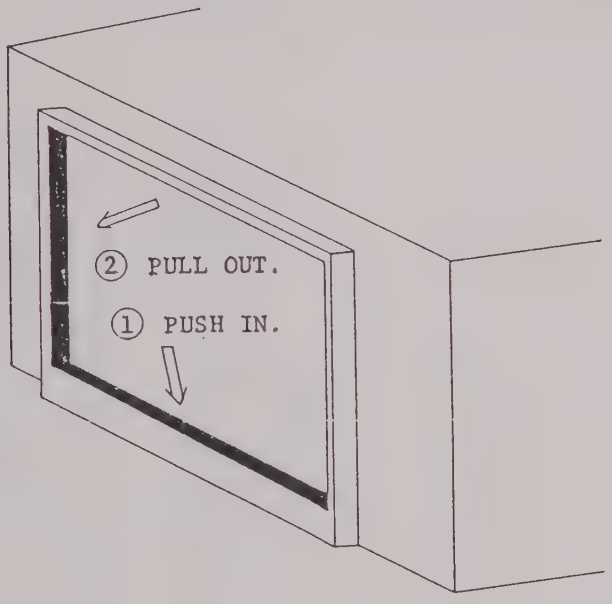
(5) Apply an input signal to the X^+ AXIS INPUT terminal ⑯ or Y^+ AXIS INPUT terminal ⑰, and adjust the trace in parallel with the graticule lines by means of the TRACE ROTATION control ⑧.

Note: As you change the location or direction of the instrument, the horizontal and/or vertical trace setting may be disturbed due to terrestrial magnetism and other causes. Re-adjust the setting as above.

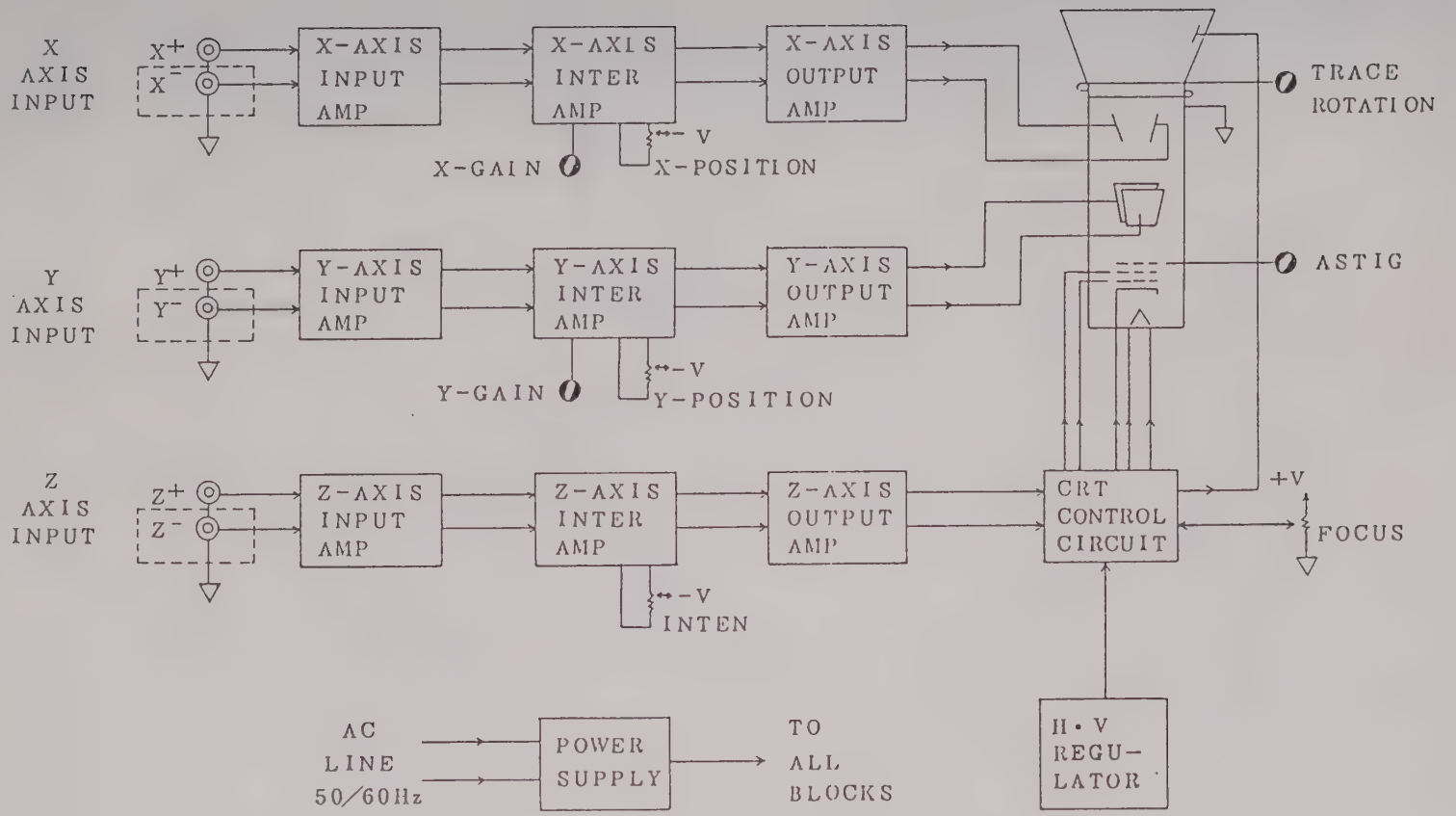
6. MAINTENANCE AND STORAGE

(1) The instrument employs a number of precision components and high voltage components. Exercise care and pay attention when transporting or storing the instrument.

(2) To clean the filter and CRT screen surface, remove the filter and graticule as illustrated below. Use a clean, soft cloth to wipe off dust from the surfaces of these components.



7. BLOCK DIAGRAM



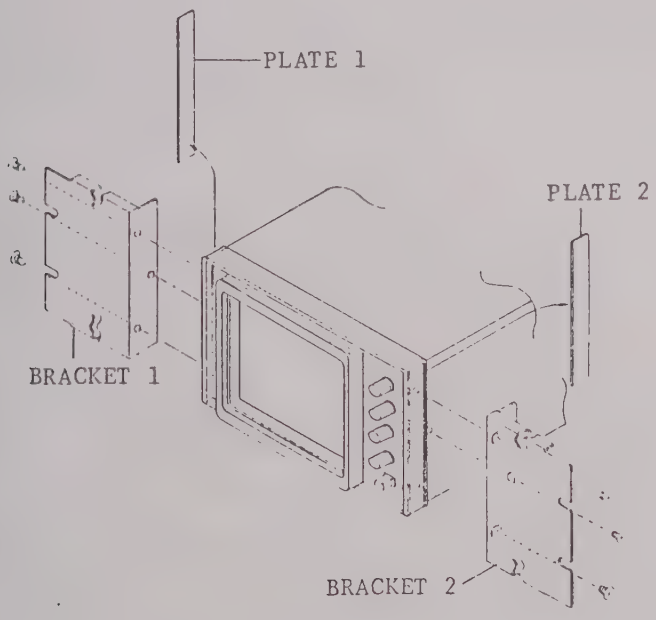
8. OPTIONS

(1) Rack Mount

One or two units of COS1611 can be installed on a standard rack by using the rack mount brackets (optional). It also is possible to install the instruments without their casings.

o Mounting Method

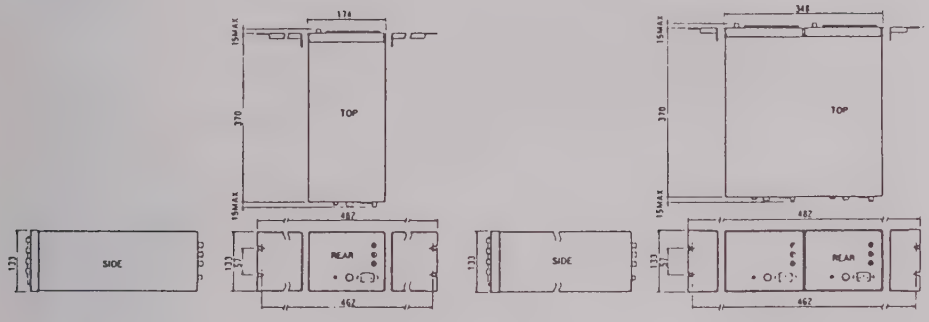
Remove plates 1 and 2, and install brackets 1 and 2.



o Mounting Dimensions

RACK MOUNT FOR
1 UNIT
RMP1931-COS1611

RACK MOUNT FOR
2 UNITS
RMP1932-COS1611



Note: To fix the brackets, be sure to use the screws which accompany the brackets or identical screws.

(2) Attenuator

When an optional attenuator is incorporated, the X and Y axis deflection sensitivity and Z axis input sensitivity are as shown in the following table.

Attenuator	X and Y axis Deflection Sensitivity	Z Axis Input Sensitivity
1/2	160 - 400 mV/DIV	1 - 4 V (Positive input for brighter trace)
1/5	400 mV/DIV - 1 V/DIV	2.5 - 10 V (Positive input for brighter trace)
1/10	800 mV/DIV - 2 V/DIV	5 - 20 V (Positive input for brighter trace)

Notes: 1. The input impedance and allowable input voltage remain unaltered regardless of whether an attenuator is incorporated or not.

2. The Z axis input sensitivity is adjusted to maximum when shipping the instrument from the factory.

Indication of Options

The optinal items incorporated into the instrument are indicated by a code number on the instrument rear panel.

Code No. for options: OP - ① ② ③ ④

A letter of 1 - 9, A - F is entered into each of the boxes. The codes are as shown in the following table.

	① Display			② X-axis			③ Y-axis			④ Z-axis		
Code No.	CRT phosphor	Graticule	Illumination	Polarity	Input impedance	Attenuator	Polarity	Input impdacne	Attenuator	Polarity	Input impedance	Attenuator
0	Standard	OUT	x	Positive	1 MΩ	1/1	Positive	1 MΩ	1/1	Positive	1 MΩ	1/1
1			o			1/2			1/2			1/2
2		IN	x			1/5			1/5			1/5
3			o			1/10			1/10			1/10
4	Persistent image	OUT	x		50 Ω	1/1		50 Ω	1/1		50 Ω	1/1
5			o			1/2			1/2			1/2
6		IN	x			1/5			1/5			1/5
7			o			1/10			1/10			1/10
8	—	—	—	Negative	1 MΩ	1/1	Negative	1 MΩ	1/1	Negative	1 MΩ	1/1
9						1/2			1/2			1/2
A						1/5			1/5			1/5
B						1/10			1/10			1/10
C					50 Ω	1/1		50 Ω	1/1		50 Ω	1/1
D						1/2			1/2			1/2
E						1/5			1/5			1/5
F						1/10			1/10			1/10

Legneds OUT: Outside x: Without
IN: Inside o: With

LIMITED WARRANTY

All instruments sold by KIKUSUI INTERNATIONAL CORPORATION are warranted to the original purchaser against defects in materials and workmanship from the date of original shipment to the purchaser within the following time limits:

Oscilloscope	—	2 year limited warranty
Power Supply	—	5 year limited warranty
Test Instrument	—	1 year limited warranty

However, this warranty excludes accessories, batteries, lead wires, and probes. Also, this warranty does not apply to any instruments determined by KIKUSUI INTERNATIONAL CORPORATION to have been subjected to customer alteration, modification, negligence or misuse.

In the event of any defects determined by KIKUSUI INTERNATIONAL CORPORATION to be covered by this warranty, KIKUSUI INTERNATIONAL CORPORATION will, at its sole option, repair or replace the defective instrument without charge and at its expense reship anywhere in the United States. To obtain warranty service, the defective instrument must be returned within thirty (30) days after the expiration of the applicable warranty period to KIKUSUI INTERNATIONAL CORPORATION or an Authorized Warranty Repair Station, properly packaged and with transportation and insurance prepaid. This warranty is valid only in the United States of America. Any customers of KIKUSUI INTERNATIONAL CORPORATION located outside of the United States should check with their nearest Authorized Agent for warranty information applicable to them.

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